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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/706,320	11/12/2003	Craig S. Gittleman	GP-303297	6448

7590                    07/19/2007  
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EXAMINER
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LAWRENCE JR, FRANK M

ART UNIT	PAPER NUMBER
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1724

MAIL DATE	DELIVERY MODE
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07/19/2007

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/706,320

Filing Date: November 12, 2003

Appellant(s): GITTELMAN ET AL.

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John A. Miller  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed August 18, 2006 appealing from the Office action mailed March 3, 2006.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

No amendment after final has been filed.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

3986849	Fuderer et al	10-1976
5820656	Lemcoff et al.	10-1998
5807423	Lemcoff et al.	9-1998
6299994	Towler et al.	10-2001

2002/0110504

Gittleman et al.

8-2002

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

Claims 6 and 7 are rejected under 35 U.S.C 112, first paragraph. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 6 and 7 recite third and fourth equalization down stages taking place following the second down stage recited in claim 1. Amended claim 1 recites that the blow down stage “directly” follows the second equalization stage. There is no disclosure in the original specification that describes such an embodiment where the blow down stage directly follows the second equalization stage, and that third and fourth equalization stages take place between the second stage and blow down stage.

Claims 6, 7, 13, 15, 16, 38, 40, 41, 58, 60 and 61 are rejected under 35 U.S.C. 112, second paragraph. Claims 6 and 7 are indefinite because it is unclear how the blow down stage can directly follow the second equalization stage, while the third and fourth equalization stages take place between the second stage and blow down stage. With respect to claims 13, 15, 16, 38, 40, 41, 58, 60 and 61, the % hydrogen should be defined as mole %, volume %, or weight %.

Claims 1-8, 11, 14-17, 20-23, 26-33, 36, 39-42, 45-48, 51-62 and 65-71 are rejected under 35 U.S.C. 102 (b). Fuderer et al. '849 teach a pressure swing adsorption system, comprising at least

nine adsorption tanks, each having a feed end connected to a feed manifold and an exhaust manifold, a product end connected to a product manifold and several interconnecting manifolds, valves for controlling flow between each tank and each manifold, an activated carbon sorbent at the feed end of the tank, and a calcium zeolite A adsorbent in the product end of the tank, wherein the system is used to produce over 99.99% pure hydrogen product from a feed stream containing hydrogen and impurities such as carbon monoxide, carbon dioxide, nitrogen, water, light sulfur compounds, and light saturated and unsaturated hydrocarbons (includes methane, ethane, propane, etc.) (see col. 7, lines 47-68, col. 8, lines 20-36, col. 9, lines 14-34, col. 12, line 66 to col. 13, line 26). In operation, the system is cycled by performing steps on each tank, including operating in a production stage for a plurality of cycle periods to produce product gas from feed gas, operating in a first equalization down stage following the production stage for a cycle period by coupling the product end to the product end of an adjacent vessel at a lower pressure to lower the pressure, operating in a second equalization down stage for a cycle period by coupling the product end to the product end of another vessel at a lower pressure, operating in a third equalization down stage (PP stage) for two cycle periods by coupling the product end to the product end of another vessel that is at a purge pressure to lower the pressure, operating in a blow-down stage following the PP stage for a cycle period to reduce the tank to an exhaust pressure, operating in a purge stage for two cycle periods by feeding reduced pressure product gas into the product end of the tank and emitting exhaust gas through the feed end, operating in two to four consecutive, separate equalization up stages for one cycle period each following the purge stage by coupling the product end to the product end of an adjacent tank at a higher pressure to increase pressure, operating in a product pressurization stage (FR stage) following the

Art Unit: 1724

last equalization upstage for one cycle period by pressurizing the vessel with product gas to a product pressure, and operating in the production stage again (see figures 5-7 for 3 equalization stage embodiment, figures 11-13 for 4 stage embodiment). The system operates at between 3-5 atm at points between the equalization down stages and blow-down stage (see figures 4a, 4b, col. 9, lines 25-50). With respect to claims 58-62 and 65-70, no structural limitations are recited that would distinguish the claimed device over the system of the prior art.

Claims 13, 18, 19, 24, 25, 38, 43, 44, 49, 50, 63 and 64 are rejected under 35 U.S.C. 103(a).

Fuderer et al. '849 disclose all of the limitations of the claims except that zeolite is a zeolite 5A, that the feed gas contains less than 59% hydrogen, and that the PSA system operates at between 60-100° C. Absent a proper showing of criticality or unexpected results, it is submitted that the operating temperature is a parameter that would have been routinely optimized by one having skilled in the art in order to achieve optimum adsorption and desorption conditions on the adsorbents whose operation is temperature sensitive. Also, one having ordinary skill in the art would know to select a type of zeolite that is most effective for adsorbing target contaminants based on cost, availability, the level of contamination, and the desired purity level of the product gas, and to use the system to purify feed gas having any acceptable or conventional level of hydrogen.

Claims 9 and 34 are rejected under 35 U.S.C. 103(a). Fuderer et al. '849 disclose all of the limitations of the claims except that valves at the feed and product ends are rotary valves.

Lemcoff et al. '656 disclose the use of a separate rotary valve at both the feed end and the

product end of adsorber vessels as an alternative to the use of multiple fixed valves. It would have been obvious to one having ordinary skill in the art at the time of the invention to substitute a separate rotary valve for both the feed and product valves of the adsorber vessels of Fuderer et al. '849 in order to reduce the number of valves and moving parts requiring control.

Claims 10, 35 and 55 are rejected under 35 U.S.C. 103(a). Fuderer et al. '849 disclose all of the limitations of the claims except that valves at the feed and product ends are a single rotary valve. Lemcoff et al. '423 disclose the use of a single rotary valve for both the feed and product streams from multiple adsorber vessels as an alternative to the use of multiple fixed valves. It would have been obvious to one having ordinary skill in the art at the time of the invention to substitute a single rotary valve for both the feed and product valves of the adsorber vessels of Fuderer et al. '849 in order to reduce the number of valves and moving parts requiring control.

Claims 12 and 37 are rejected under 35 U.S.C. 103(a). Fuderer et al. '849 disclose all of the limitations of the claims except that the hydrogen product gas is fed directly to a fuel cell. Both Towler et al. '994 and Gittleman et al. '504 disclose that purified hydrogen product gas can be fed directly into a fuel cell. It would have been obvious to one having ordinary skill in the art at the time of the invention to direct the purified hydrogen product gas from the system of Fuderer et al. '849 directly into a fuel cell because the prior system is capable of producing high purity hydrogen that can be used in a fuel cell.

**(10) Response to Argument**

Applicant argues that the blow down step in Fuderer does not take place directly following the equalization down stage, however in the embodiment of figures 5-7 for example, the Fuderer PP stage anticipates the second equalization down stage as claimed because the vessel product end is coupled to the product end of an adjacent vessel at a purge pressure to lower the pressure. For the purposes of anticipation, the PP state of Fuderer is taken to be another equalization down stage because its function is the same as applicant's claimed equalization down stages.

Applicant also argues that Fuderer specification does not appear to indicate how the vessels are interconnected during the down stages and PP stage, however the process flow diagram, time diagram, and valve operation chart of figures 5-7, for example, show that the product ends are coupled. To illustrate the process conduit couplings during the system operation, the examiner has attached copies of figure 5 annotated for the first eight time cycles, showing open valves and vessel conditions. Applicant further argues the Fuderer fails to disclose vessel coupling in the PP stage, however note in the first time cycle for figure 5, for example, where vessel 5 in the PP stage is coupled to the product end of vessel 4 which is in a purge stage, via valves 34 and 35. With respect to claim 52, the system is additionally inherently capable of performing all of the steps regardless of the disclosed operation because it contains all of the structural components needed to do so.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., that a second equalization down stage includes coupling the product end of the vessel to the product end of an

Art Unit: 1724

adjacent vessel and that there is a blow-down stage directly following the second down stage) are not recited in the rejected claim 28. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant also argues that Fuderer fails to disclose a purge stage including feeding reduced-pressure product gas into the product end of the vessel, however this takes place as co-current product gas emanating from a vessel in a PP stage is directed to a vessel in a purge stage. With respect to claim 7, applicant argues that Fuderer fails to disclose fourth equilibrium down and up stages, however this embodiment is disclosed in figures 11-13, col. 12, line 66 to col. 13, line 26.

Applicant also argues that the Fuderer system does not operate at pressures less than 7 atm, however it is submitted that the prior system operates in a broad range of pressures over its time cycle, including pressures at and between 41-83 psi (about 3-6 atm) during depressurization and blow-down stages (see figures 4a, 4b, col. 9, lines 35-50). With respect to claims 19, 44 and 64, the examiner agrees that Fuderer *alone* does not specifically disclose using a zeolite 5A adsorbent, but does disclose using a calcium zeolite A in an example. It is the examiner's contention that one having ordinary skill in the art would have known to select a type of zeolite that is most effective for adsorbing target contaminants based on cost, availability, the level of contamination, and the desired purity level of the product gas.

With respect to the rejections of claims 9, 10, 12, 13, 18, 24, 34, 35, 37, 38, 43, 49, 50, 55 and 63, applicant has not provided any different arguments but has asserted that the secondary references also fail to disclose the recited sequence of pressure swing adsorption (PSA) cycle

Art Unit: 1724

steps. The examiner has not used any of the secondary reference to show PSA cycle steps but instead to show a motivation for using other features such as a single rotary valve instead of multiple valves and for providing purified hydrogen to a fuel cell.

With respect to the 35 U.S.C 112 first and second paragraph rejections of claims 6 and 7, applicant states that one of ordinary skill in the art would recognize that the blow-down stage follows the third or fourth equalization down stage, even though the independent claims state that the blow-down stage *directly* follows the second equalization down stage. This is not found persuasive because PSA methods can have intermediate pressurization or depressurization steps that do not follow traditional system cycle pressure profiles. Also, the independent claims were amended in the first place to include the word “directly” in attempt to distinguish over the Fuderer reference which has the PP step between the equalization down step and blow-down steps, so applicant is arguing that the blow-down step does not have to directly follow the second equalization down step.

With respect to the 35 U.S.C. 112 second paragraph rejection of claims 13, 15, 16, 38, 40, 41, 58, 60 and 61, applicant argues that one of ordinary skill in the art would know that the recited percentages are mole, volume or weight percent, but does not point out which one is being used. The examiner does not agree and cannot determine whether the recited concentrations are by mole, volume or weight percent.

#### **(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Art Unit: 1724

Respectfully submitted,

Frank M. Lawrence



Primary Examiner

7-16-07

AU 1724

Conferees:

  
Duane Smith  
Gregory Mills

Appendix I

U.S. Patent ~~Oct. 19, 1976~~ Sheet 5 of 18 ~~3,986,888~~

● = open  
○ = open flow regulator

FIG. 5

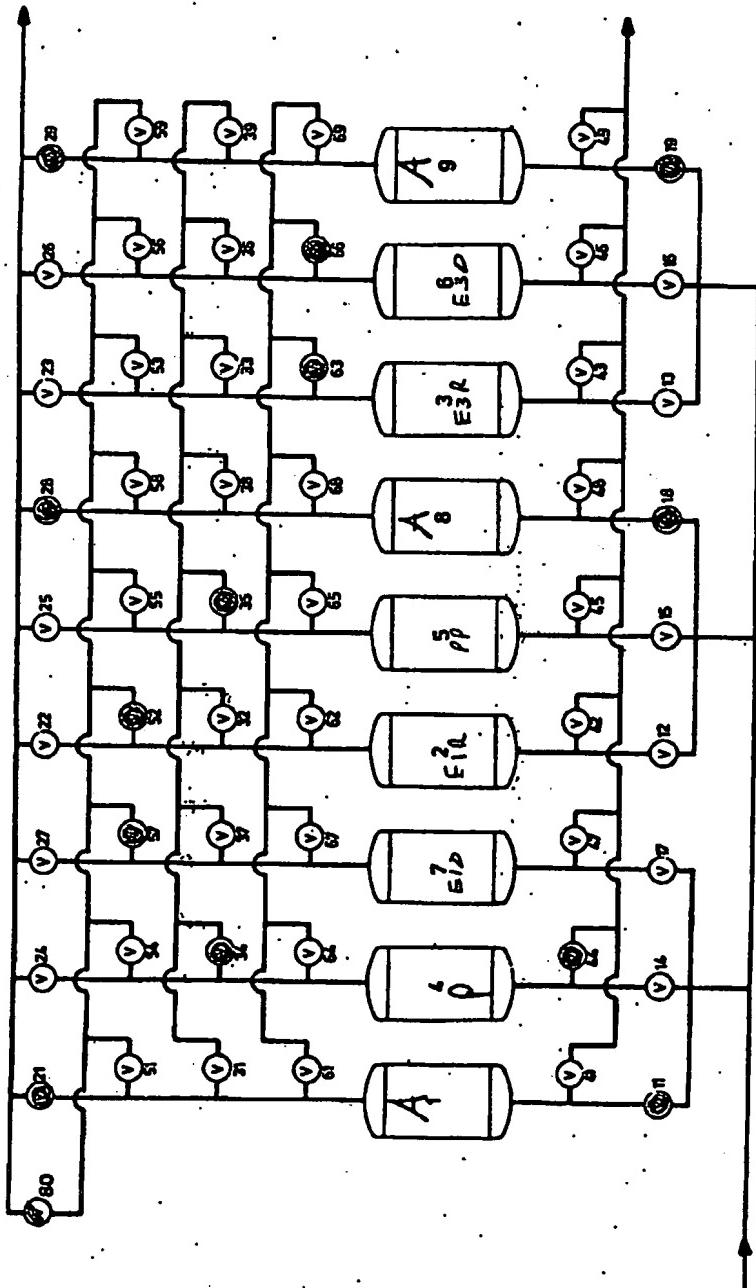


FIG. 5

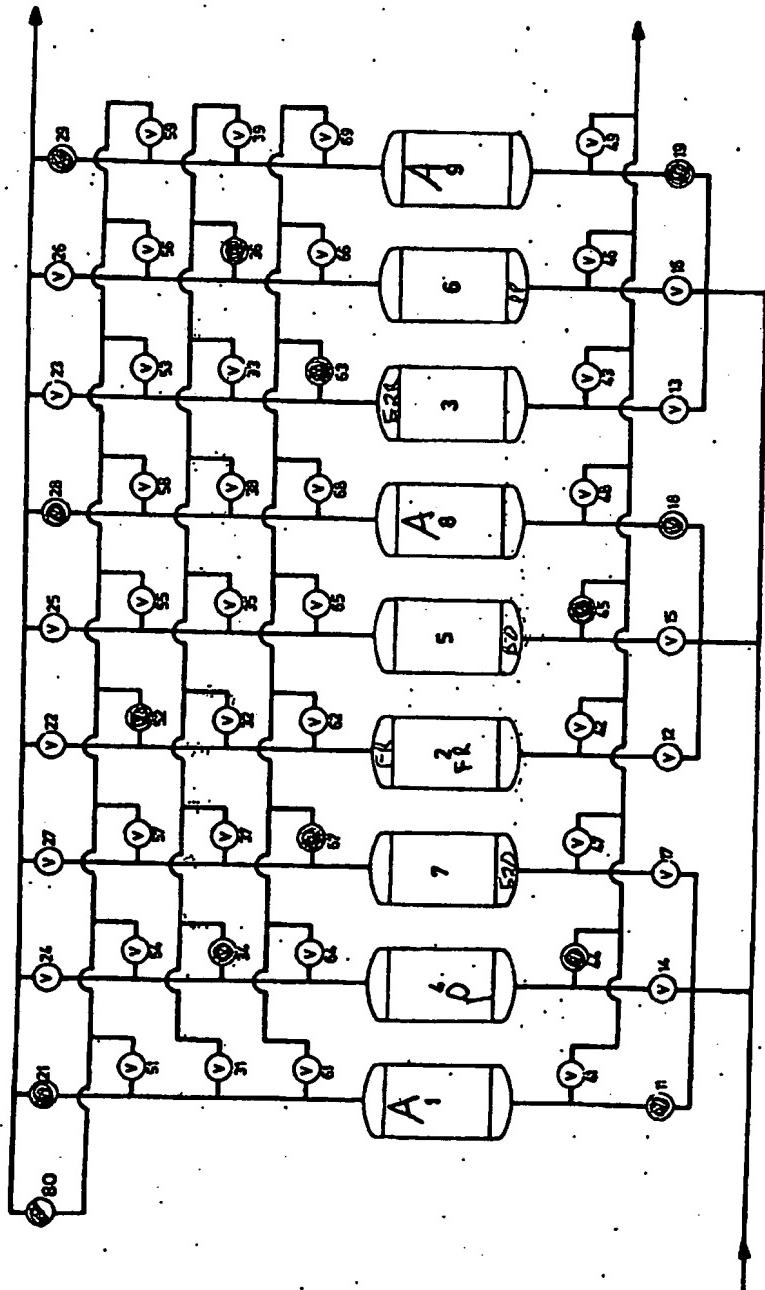
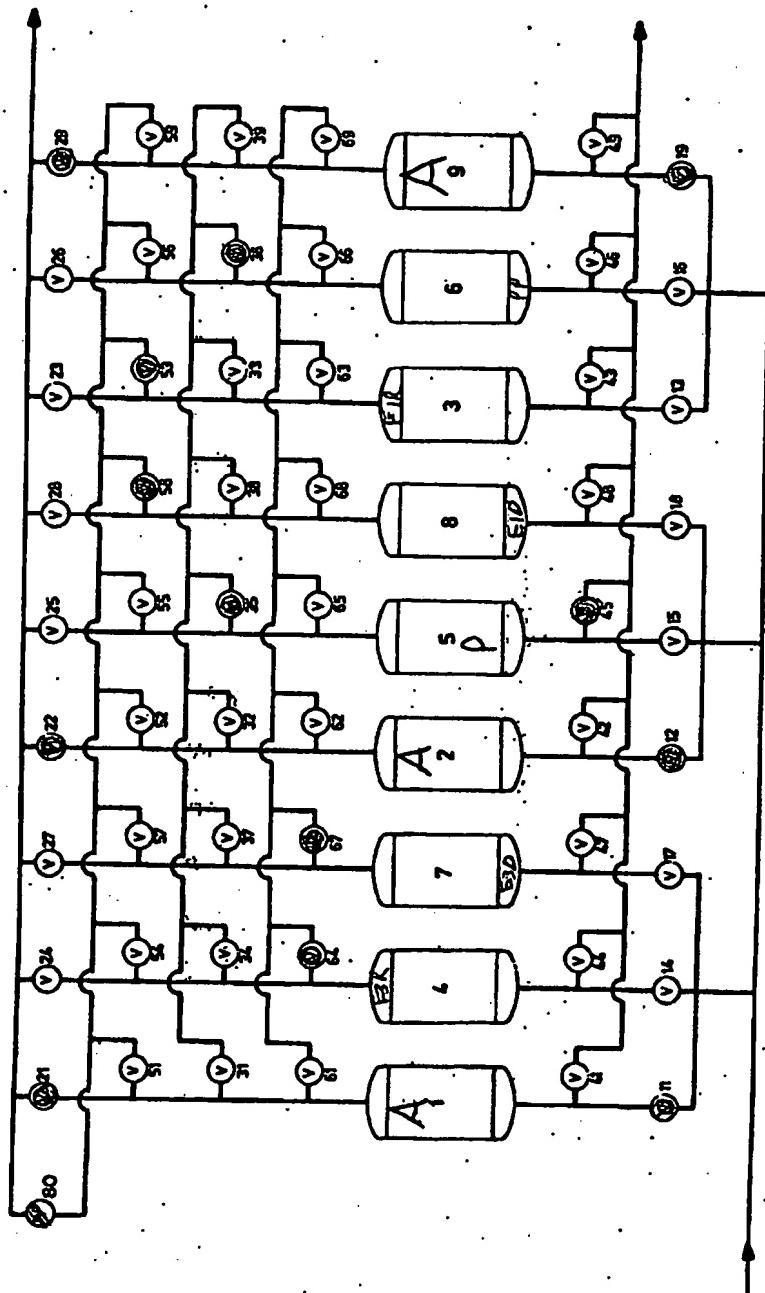


FIG. 5



## Appendix . 4.

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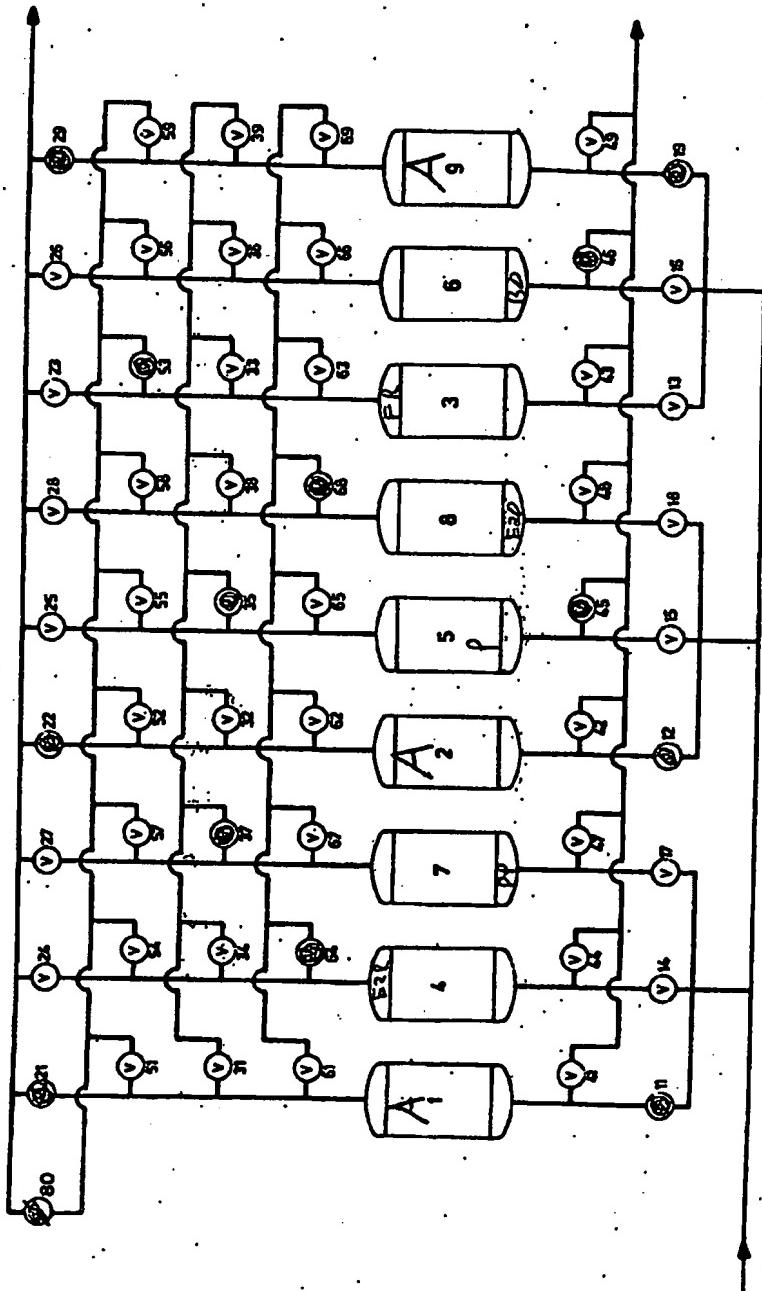


FIG. 5

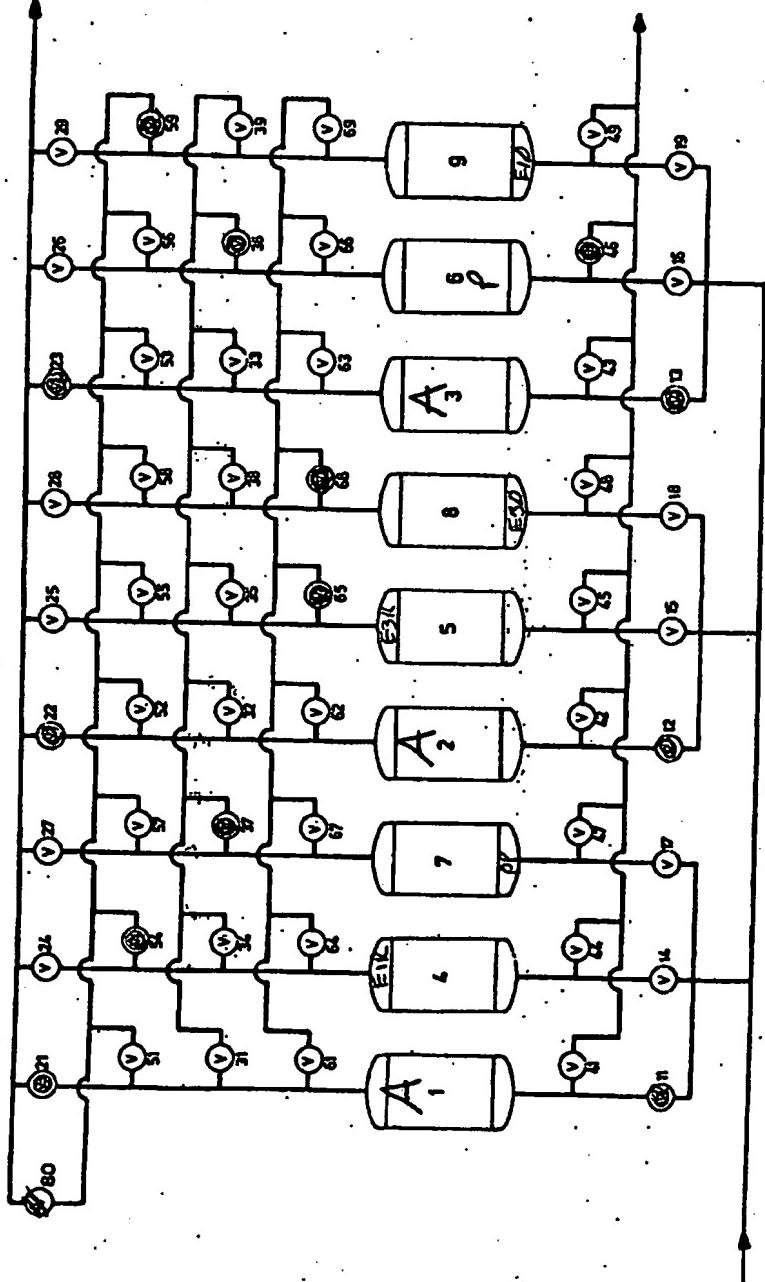


FIG. 5

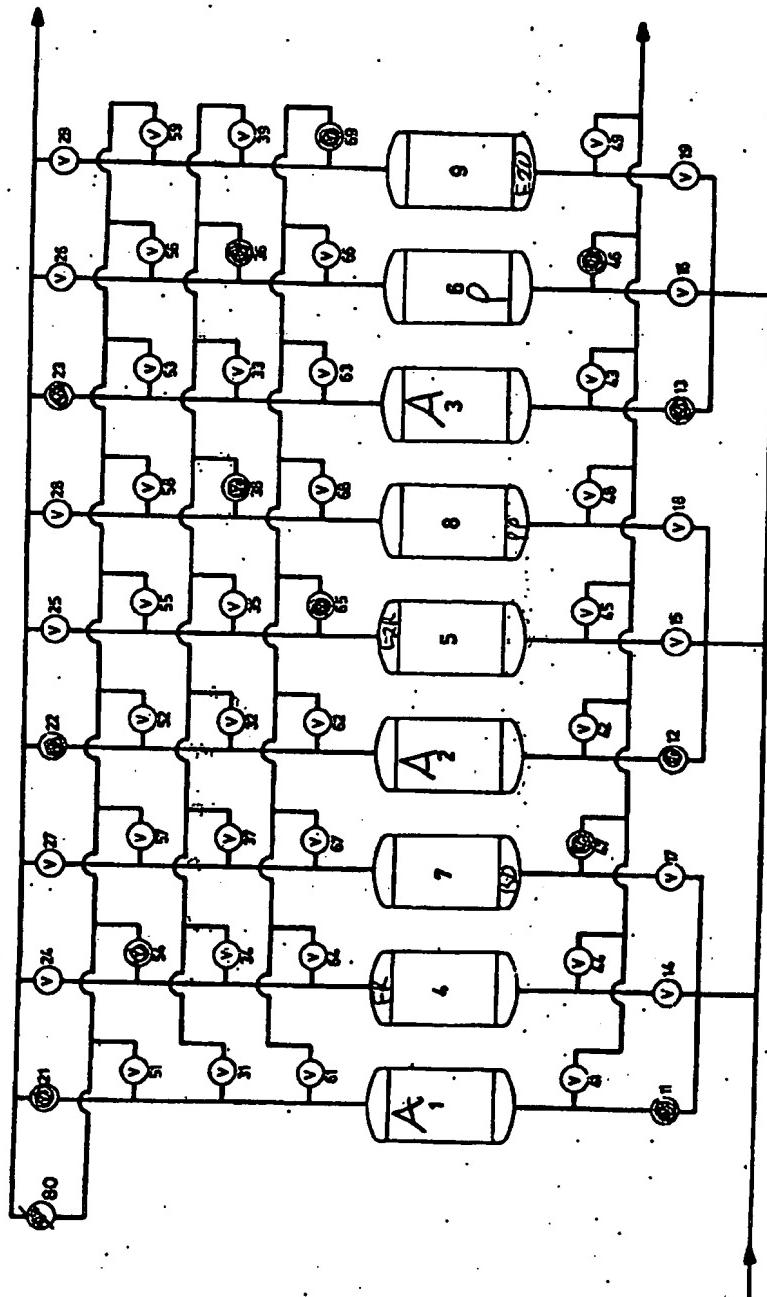


FIG. 5

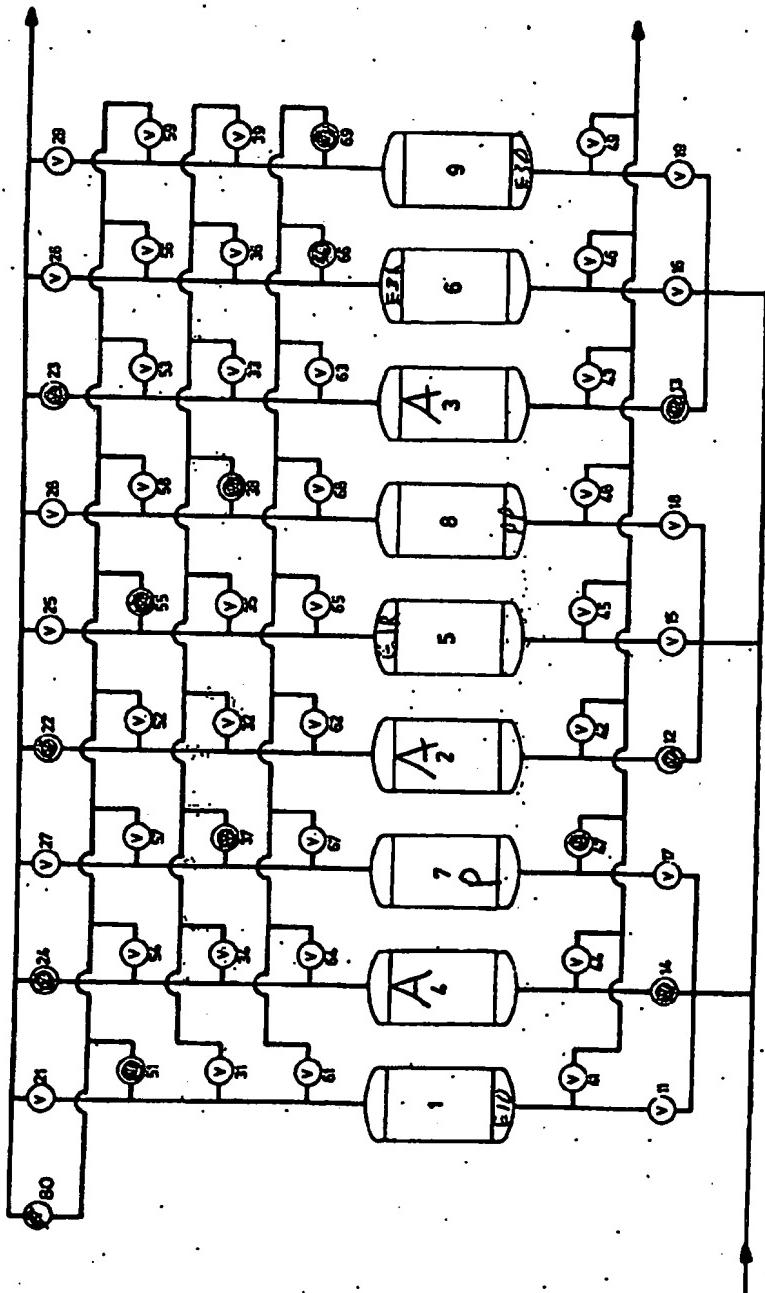


FIG. 5

